Dynamics of Continuous, Discrete and Impulsive Systems
Series **B** : *Applications & Algorithms* **32 (2025)** 289-309

WHITE SHARK OPTIMIZER FOR THE QUADCOPTER PID TRACKING CONTROL

Fatiha Loucif

Laboratoire d'Automatique et Informatique de Guelma LAIG
Université 8 Mai 1945, Guelma, Algerie

Abstract. In this paper, we tackle the problem of PID control tuning of a quadrotor Unmanned Aerial Vehicle (UAV). This work proposes PID gains optimization using White Shark Optimizer (WSO). WSO performance is evaluated using ITSE index performance. The simulation results show that the algorithm is capable of achieving the system convergence.

Keywords. Quadcopter modelisation, PID control, Quadcopter control.

AMS (MOS) subject classification : 37M05.

1 Introduction

Unmanned aerial vehicle UAVs were first introduced during World War I (1917), In modern times unmanned aircraft have come to mean an autonomous or remotely piloted air vehicle that flies about mimicking the maneuvers of a manned or human-piloted craft [1]. Unmanned Aerial Vehicles (UAVs) have seen unprecedented levels of growth in military and civilian application domains. are being increasingly used for surveillance, reconnaissance, mapping, cartography, border patrol, inspection, homeland security, search and rescue, fire detection, agricultural imaging, traffic monitoring, to name just a few application domains [2]. A quadcopter has four rotors, each with an independent speed, allowing a balanced change in the speed of the rotors and thus generating thrust and acceleration in the desired directions. Quadcopters are six-degrees-of-freedom (DoF) systems [3]. An appropriate controller is required to control such a multidimensional system. In this context, we can find many applications of different control methodologies. The most popular, are proportional integration derivation (PID) controllers [3-7]. The use of linear quadratic regulators (LQR) [8]. In [9] PID and LQ control techniques applied to an indoor micro quadrotor. comparing the modeling results of conventional PID and Fuzzy-PID controllers presented in [10]. quadcopter trajectory tracking control based on flatness model predictive control and Neural Network proposed in [11]. Authors investigate for the first time, an end-to-end neural network controller [12]. Sliding Mode Control (SMC) , has become one of the